

CLAIMS

Claimed is:

1. A culture/exposure apparatus for the receiving of cultures (72) with an arrangement for the treatment of the said received culture (72) having a gaseous medium, which has a mechanical flow duct (40) with an entry (42) for the introduction of the gaseous medium into the flow duct (40) and an outflow opening placed above the surface of the culture (72), whereby the flow duct (40) directs the said gaseous medium, therein characterized, in that the inner surface of the outflow opening (44) of the flow duct (40) opens itself in a trumpetlike configuration.
2. A culture/exposure apparatus in accord with claim 1, wherein the inner surface of the flow duct (40) is rotationally symmetrical in a plane transverse to the direction of flow.
3. A culture/exposure apparatus in accord with claim 1 or 2, wherein the inner surface of the outflow opening (44) of the flow duct (40) is hyperboloid in the direction of the flow.
4. A culture/exposure apparatus in accord with one of the foregoing claims wherein the arrangement for treatment of the culture with a gaseous medium includes, upstream of the outflow opening (44), the placement of a twist body (56), which imparts to the gaseous medium flowing through the flow duct (40) a rotational motion.

5. A culture/exposure apparatus in accord with claim 4, wherein the twist body (56) has at least one channel (58) possessing a spiral worm shape.
6. A culture/exposure apparatus in accord with one of the foregoing claims, wherein the flow duct (40), between its entry (42) and its outflow opening (44) possesses a guide section (46) with a cylindrical inner surface.
7. A culture/exposure apparatus in accord with claim 6, wherein the twist body (56) has a cylindrical outer shape with implanted guide channels (58), which is accommodated in the cylindrical flow guide section (46) of the flow duct (40)
8. A culture/exposure apparatus in accord with claim 7, wherein the twist body (56) possesses a cone shaped body located upstream and positioned in opposition to the direction of flow and the outer surface of which at its base is free of sharp base edges and the said cone shaped body transitions into the inserted guidance channel (58).
9. A culture/exposure apparatus in accord with one of the foregoing claims, wherein the separating distance of the outflow opening (44) to the surface of the culture (72) is so adjusted, that the through-flow cross-section (Q2) of the annular opening between the opening rim (48) of the flow duct (40) and the surface of the culture (72) is smaller than the cross-section (Q1) in the flow duct

(40) upstream of the outflow opening (44) which has a trumpet shaped opening (44).

10. A culture/exposure apparatus in accord with claim 9, with an adjustment apparatus for the displacement of the separating distance.
11. A culture/exposure apparatus in accord with claim 10, wherein the adjustment apparatus is a manually activated setting screw with an adjustment gear.
12. A culture/exposure apparatus in accord with one of the foregoing claims, with a shell shaped culture container (10; 112) for the acceptance of cultures (72), wherein the ratio between the inside diameter of the culture container (10) at the height of the rim (48) of the outflow opening (44) and the outside diameter of the outflow opening (44) is dimensioned in such a manner, that the through-flow cross section (Q3) of the annular opening between the outflow opening (48) and the inner wall of the culture container (10; 112) is larger than the cross-sectional section (Q1) of the annular opening in the flow duct (40) upstream of the self opening, trumpet shaped, outflow opening (44).
13. A culture/exposure apparatus in accord with one of the foregoing claims, which includes an inner chamber (8) for the acceptance of the culture container (10; 112) with the culture (72), having a first spatial zone (50) for accommodating the flow duct (40) and a second spatial zone (8) for carrying the said culture container

(10; 112), whereby the flow duct (40) extends itself through a central section (52) of the upper spatial zone (50) into the inner chamber (8) and in the remaining section of the upper spatial zone (50) a vacuum opening (68) is provided, which is connected to a means serving as a source of vacuum.

14. A culture/exposure apparatus in accord with claim 13, wherein the flow duct (40), culture container (10) and the inner chamber (8, 50) are designed to be rotationally symmetric.
15. A culture/exposure apparatus in accord with claim 13 or 14, wherein the gaseous exposure apparatus embraces an annular orifice (62), which, in an air tight manner, is placed between the inner wall of the inside space (8, 50) and the outer wall of the flow duct (40), and which possesses rotation symmetric, apportioned air passages (66).
16. A culture/exposure apparatus in accord with claim 15, wherein, by means of the dimensioning of the air passages (66) of the annular orifice (62) the degree of suction in the exposure apparatus is calibrated.
17. A culture/exposure apparatus in accord with one of the foregoing claims, wherein the Exposure apparatus possesses a volume-flow meter or a mass-flow meter.
18. A culture/exposure apparatus in accord with claim 17, wherein the exposure apparatus possesses a positioning

valve connected to the volume-flow meter or mass-flow meter.

19. A culture/exposure apparatus in accord with one of the foregoing claims, wherein the exposure apparatus is equipped with a heating means for temperature regulation of the gaseous medium to be introduced thereto.
20. A culture/exposure apparatus in accord with claim 19, wherein the heating means includes a heating device placed on the wall of the flow duct (40).
21. A culture/exposure apparatus in accord with one of the foregoing claims, which apparatus is constructed in two parts, including first, a lower part (2; 108) which contains the culture container (10; 112) and second, an upper part (4) which supports the exposure apparatus, and by means of the act of separation of the lower part (2; 108) from the upper part (4), access to the culture container (10; 112) is assured.
22. A culture/exposure apparatus in accord with one of the foregoing claims, which apparatus is designed for the acceptance of a plurality of culture containers (10; 112), whereby the Exposure apparatus includes in all cases one flow duct (40) per culture container (10; 112) the entrances of which (42) are connected to one, common suction fitting for the introduction of the gaseous medium into the said exposure apparatus.

23. A culture/exposure apparatus in accord with claim 21, or 22, further in reference to the claims 13 to 20, wherein the inner chamber (8, 50) is formed in each case by a recess in the upper part (4) and in the lower part (2; 108).
24. A culture/exposure apparatus in accord with one of the foregoing claims, wherein the culture container (10) is designed for the acceptance of prokaryote-cultures and the lower part (2) is made correspondingly for the acceptance of this culture container (10).
25. A culture/exposure apparatus in accord with claim 24, wherein the lower part (2) includes a heating device (36, 38) for the temperature regulation of the culture container (10).
26. A culture/exposure apparatus in accord with claim 25, wherein the lower part (2) forms a liquid chamber for the acceptance of a hot liquid, whereby the recess (8) is washed for the acceptance of the culture container (10).
27. A culture/exposure apparatus in accord with one of the foregoing claims, which possesses an ejection apparatus (12) for the removal of the culture container (10).
28. A culture/exposure apparatus in accord with claim 27, with reference to claim 23, wherein the ejection apparatus possesses an ejector pin (20), which extends through the bottom of the recess (8) and contacts the

bottom of the culture container (10), which is resident there and which said ejector pin (20) can be activated from outside of the lower part (2).

29. A culture/exposure apparatus in accord with claim 28, wherein an ejector pin (20) is furnished to each recess (8) designed for the acceptance of a culture container (10) and each ejector pin (20) can be activated separately from any other ejector pin (20).
30. A culture/exposure apparatus in accord with one of the foregoing claims, wherein the culture container (112) is constructed for the acceptance of cell cultures, and the lower part (108) is correspondingly designed for to accept this said culture container (112).
31. A culture/exposure apparatus in accord with claim 30, wherein the lower part (108) possesses a supply unit for the furnishing of cell culture in the cell culture container (112) with a liquid medium.
32. A culture/exposure apparatus in accord with claim 31, wherein the supply unit is designed for optional submersible or basal supply to the cell culture of the liquid medium.
33. A culture/exposure apparatus in accord with claim 31 or claim 32, wherein the supply unit possesses a heating means (118, 120) for the temperature regulation of the liquid medium.

34. A culture/exposure apparatus in accord with claim 21, wherein the upper part (4) and the lower part (2) are so designed, that an upper part (4) with the exposure unit, in accord with claim 21, can be used both in connection with a lower part (2), in accord with one of the claims 24 to 29, and also can be used in connection with a lower part (108), in accord with one of the claims 30 to 33.
35. A culture/exposure apparatus in accord with one of the foregoing claims, which is designed to be functional with robotic operation.
36. A culture/exposure apparatus in accord with claim 35, with reference to one of the claims 21 to 34, wherein means are provided on the lower (2; 108) and the upper (4) parts, which enable a robot to open the said lower (2; 108) and the upper (4) parts.
37. A culture/exposure apparatus in accord with claim 35 or 36, wherein means are provided on the culture container (10; 112), which enable a robot to first, remove the culture container (10) from and second, to place a culture container (10) in the under part (2).
38. A culture/exposure apparatus in accord with one of the foregoing claims, the construction of which is so designed, that it is adaptable to automatic washing in a washing station.



39. A culture/exposure apparatus for the reception of cultures (72) with an apparatus for the exposing of the accepted culture (72) with a gaseous medium, which possesses a suction fitting (74; 74') with a suction opening (76) for the intake of the gaseous medium and possesses an outlet (84; 88), which is connected with a flow guide for the conducting of the gaseous medium to a plane above the culture (72) , thereby characterized, in that the inner surface of the suction opening (76) of the suction fitting (74; 74') opens itself in a trumpetlike flare counter to the flow direction.
40. A culture/exposure apparatus in accord with claim 39, wherein the inner surface of the suction fitting (74; 74'), in a cross-section transverse to the direction of flow, is rotationally symmetric.
41. A culture/exposure apparatus in accord with claim 39 or 40, wherein the inner surface of the suction opening (76) of the suction fitting (74; 74') is hyperboloid in shape, contrary to the direction of the flow.
42. A culture/exposure apparatus in accord with one of the claims 39 to 41, wherein the suction fitting (74; 74'), between its self-opening, trumpetlike shaped, suction opening (76) and its outlet, possesses a guide section (78) with a cylindrical inner surface.
43. A culture/exposure apparatus in accord with one of the claims 39 to 42, wherein the suction opening (76) is covered with a gas-permeable cover (82).

44. A culture/exposure apparatus in accord with claim 43, wherein, the said cover (82) is a foamed material of large porosity.
45. A culture/exposure apparatus in accord with one of the claims 39 to 44, wherein the outlet (84; 88) of the suction fitting (74; 74') includes a branching to a plurality of flow guide elements.
46. A culture/exposure apparatus in accord with one of the claims 42 to 45, wherein the branching on the downstream end of the guidance section (78) is furnished with a cylindrical inner surface.
47. A culture/exposure apparatus in accord with claim 46, wherein the branching possesses projecting connection fittings (84) of cylindrical inner surfaces extending radially from the outer wall of the guidance section (78).
48. A culture/exposure apparatus in accord with claim 47, wherein the connection fittings (84) are distributed rotationally symmetrically about the outer wall of the guidance section (78) and have cylindrical inner surfaces.
49. A culture/exposure apparatus in accord with claim 46, wherein the branching in the longitudinal direction from the guidance section (78), possesses connection fittings

(88) with inside cylindrical surfaces extending from its bottom zone.

50. A culture/exposure apparatus in accord with one of the claims 46 to 49, wherein separating walls (86; 94) are placed, which run within the cylindrical interior of the guidance section (78) in its longitudinal direction, extending from the bottom thereof to above height of the connection fittings (84; 88), which form separated suction spaces for each connection fitting (84; 94).

51. A culture/exposure apparatus in accord with claim 50, with reference sofar made to the claim 49, wherein the suction spaces formed by the separating walls (86; 94) are so dimensioned, that the suction volumes in all suction connection fittings (84; 88), upon equal suction demand, are approximately equal.

52. A culture/exposure apparatus in accord with claim 50, referred back to the claim 48, wherein the suction spaces formed by the separating walls (86) within the guide section (78) are geometrically arranged in a rotation symmetric manner, further have cylindrical inner surfaces and are equally dimensioned.

53. A construction kit for the assembly of a culture/exposure apparatus in accord with one of the foregoing claims, which would contain the following four elements:

- lower part (4) in accord with one of the claims 21 to 52,

- upper part (96) with an apparatus for the exposure of the culture (72) held in a culture container (10; 112) to a gaseous medium, whereby the said exposure apparatus encompasses a suction fitting for the intake of the gaseous medium and a flow guide (98) for the conductance of the gaseous medium to a plane above the surface of the culture (72),
- a lower part (2) in accord with one of the claims 24 to 29, and also
- lower part (108) in accord with one of the claims 30 to 33.

54. A procedure for the culture and exposure of prokaryotes with the use of a culture/exposure apparatus with a recess (8) for the reception of a culture container (10) carrying the prokaryotes to be cultured as well as an apparatus for the exposure of the said prokaryotes residing in the culture container (10) to a gaseous medium, whereby the exposure apparatus encompasses a suction fitting for the intake of the gaseous medium and a flow duct (40; 98) connected with the said suction fitting for the conducting of the gaseous medium to a plane above the resident prokaryotes in the culture container (10; 112).

55. A culture/exposure apparatus for the carrying out of a procedure in accord with claim 55, with a recess (8) for the acceptance of a culture container (10) carrying the to-be-cultivated prokaryotes as well as an apparatus for the exposure of the said prokaryotes resident in the culture container (10) to a gaseous medium, whereby the

exposure apparatus possesses a suction fitting for the intake of the gaseous medium and a therewith connected flow duct (40; 98) for the conductance of the gaseous medium over the prokaryotes resident in the culture container (10; 112).

56. A culture/exposure apparatus in accord with claim 55, which encompasses a lower part (2) designed in accord with one of the claims 24 to 29 for the acceptance of the culture container 10.